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Enclosure (B) to NavTechMisEu Serial 1665

10 October 1945

DESCRIPTION OF THE "KAKADU" PROXIMITY FUSE

I. General.

Three types of automatic fuses were used in the German Army. These were optical, acoustic, and radio frequency types. For the Henschel missile, the 298 Rocket it was intended to use primarily the "Kakadu" radio frequency fuse developed by the Donag, (Danubia A.G.). Radio frequency fuses were also developed by other firms. For example "Marabu" by Siemens & Halske in Berlin operated on the principle of radar. In addition the Patent-verwertungsgesellschaft firm in Salzburg had developed the "Kugelblitz" fuse. This last fuse operated on the same principle as that developed by Donag. AEG in Berlin produced a device similar to the Kugelblitz. Both of these devices (Marabu and Kugelblitz) are substantially simpler than Kakadu with respect to the number of tubes required, the complexity of the construction, and especially with regard to tuning. However they did not meet the sever specifications imposed and were not equal to Kakadu in tests. The firm from whom the Donag held the contract for the development of Kakadu was the firm of Henschel in Berlin. It was not until the last two years that the RLM (Reichs-Luftfahrt-ministerium) took a hand in the matter so that the construction of the fuses was directed by a high frequency fuse committee of the RLM. Two different types of the rocket were developed, one for ground-to-air and one for air-to-air applications. The same fuse was to be used in both. The rocket was intended to be brought into the neighborhood of the target plane by means of remote control and the automatic detonation of the charge was to be accomplished automatically at the point of closest approach. The rocket had the form of an airplane and was driven with a rocket motor. At the nose of the fuselage the antenna for the fuse Kakadu was mounted under a wind screen. Directly beneath this wind screen was located a wind-driven generator serving for the entire power requirements. The normal wing spread and also the fuselage length was about one meter. The antenna extended about 50 cm. further out in front. The diameter of the fuselage was about 40 cm.

The following firms were involved in the development as sub-contractors to the Donag:

1. Dr. Friedrich Benz, Director of the Radio Technical Experimental Institute at the Technological Gewerbe Museum in Vienna, as technical consultant.

2. Dipl. Ing. Friedrich Bedenig, as director of the development committee.

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Description of the "Kakadu" Proximity Fuse (Cont'd).

3. Dr. Josef John, Vienna 13. Mittermaiergasse 2-6, as physicist.

4. Mr. Otto Cihak, Gablitz Hochbuch 116, as development engineer.

5. Ing. Alexander Poeckel as mechanic.

Work has been underway on the project since 1942. The specifications were repeatedly changed by the responsible authorities especially by increase in demands upon sensitivity, security against mechanical vibrations and ability to withstand low temperatures.

The development was nearly finished at the end of March of this year. The device was ready for mass production. In substance only a few changes were required to increase frequency stability in the face of temperature changes.

Description of the Device.

The equipment had a cylindrical form about 30 cm. long and 15 cm. diameter. The transmitting and receiving antennas increased this length to a total of about 50 cm. The antennas were made of aluminum tubes or strips. The chassis elements and containers for the components were made of galvanized iron. The device having a cylindrical form was mounted at the upper front side of the fuselage in an opening adapted thereto so that the antennas concealed beneath a wind screen projected out into the open. The voltage furnished by the generator amounted to 24 volts for heating and 210 volts for plate voltage purposes. The voltage variation amounted to ± 15%. The plate load of the device amounted to some 55 milliamperes and the heater current to some 500 milliamperes.

The tubes employed were army tubes of the type RV12 P2000 with the exception of the high frequency oscillator which was a tube of type RL12 T1. In addition a voltage stabilizer tube StV 150/15 was used. For a firing release a telegraphic release of Siemens & Halske, type Trls 64a was used.

Principle and Mode of Operation.

The equipment was built on the principle of the reflection of ultra short wave radiation. The high frequency energy radiated out from the oscillator, and which was modulated with an IF frequency for reasons of security, was reflected upon approach ((of the missile?)) to a metal surface such as the fuselage or wing of a

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Description of the "Kakadu" Proximity Fuse (Cont'd).

plane. This reflected energy arriving at the receiver antenna would be twice demodulated in a detector tube and in the ((at output)) of an IF ((amplifier)) tube following thereafter. The low frequency so produced was amplified in the Reflex and in the output stage and fed to the relay.

Technical Details.

The carrier frequency amounted to some 300 megacycles but was not limited to this value. It might instead vary between 298 and 310 megacycles. The IF frequency varied between 128 and 132 kilocycles. The modulation of the radio frequency with the IF was intended to reduce the possibility of jamming by means of cross modulation. In addition a high degree of selectivity was achieved in the receiver by the use of a "Topfkreises" ((cavity resonator)). The radiation from the transmitting antenna amounted to about 0.1 watt. The amplifier was tuned to low frequencies. The sensitivity of the device could be adjusted by means of the feed-back at the Reflex tube and also by adjustment of the holding current of the relay. The tuning procedure for the antennas was one of the most difficult and tedious problems in the use of the equipment.

Tuning Procedure for the Device.

1. Correct adjustment of the carrier frequency by means of a frequency meter.

2. The transmitter antenna was to be so adjusted by means of an absorption meter as to minimize the radiating energy. This was actually accomplished by trimming the coupling element. ((betwedn the oscillator and the antenna)).

The balance converter No. I in the accompanying sketch was intended to minimize radiation by the chassis and fuselage. The balance converter No. II served to protect the receiving antenna. Together the balance converters I and II constituted the two dipoles of the transmitting dipole. The bell-shaped structure between the two was used as a tuning capacitor for the transmitter antenna. A blocking surface located between the dipoles of the transmitting antenna served to decouple the transmitting and receiving antennas. In addition thereto there was a further balance converter which was likewise intended to preclude direct reception from the transmitting antenna. This balance converter and the antenna ends constituted the two receiving dipoles. Between these two we have again a bell-shaped tuning capacitor for the receiving antenna. Tuning of the individual balance converters needed to fit as

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Description of the "Kakadu" Proximity Fuse (Cont'd).

exactly as possible the instantaneous carrier frequency. The sensitivity of the device could be adjusted and checked by means of a rotating dipole. We learned by experience that the reflecting capacity of a plane was roughly equivalent to 15 or 20 tuned dipoles. If our device operated at a range of 5 meters from a tuning dipole the proper degree of sensitivity had been achieved. The low frequency was checked by means of an oscillograph at the output.

Fly-over Tests.

At the close of the development the device was tested by being mounted on a tower. It was energized and the firing contacts were made to operate two photographic equipments. Fly-over tests at various altitudes were then conducted. From the photographs the range between the plane and the fuse was determined and the exact firing point could be determined by photographic records of a string oscillograph coupled to the device. The tests indicated that the required sensitivity had been exceeded.

The shock and vibration specification to be met was of 10 g. The device was to operate over an ambient temperature range of -40 to +70° C. These specifications produced great difficulties for the developments and their satisfaction required a great deal of time. By means of extremely stable construction it was achieved after much testing and the desired degree of proof against vibration was achieved. The frequency stability required over the range of temperature changes was also finally achieved by means of compensation of the oscillator with ceramic condensors of various temperature coefficients. Pre-production series of 15 and later 150 units were furnished to the separate testing stations of the RLM and of Henschel.

Evacuation.

In spite of severe air attacks the firm received no orders for evacuation from Berlin. On the fourth of April 1945 the entire Kakadu project was packed up in several boxes with the most important pieces of test equipment and given over to a steam boat company for further transport in the direction of Regensburg. For lack of transport means some boxes stayed behind and these fell into the hands of the Red Army or of the GPU.

(Signed) OTTO CIHAK

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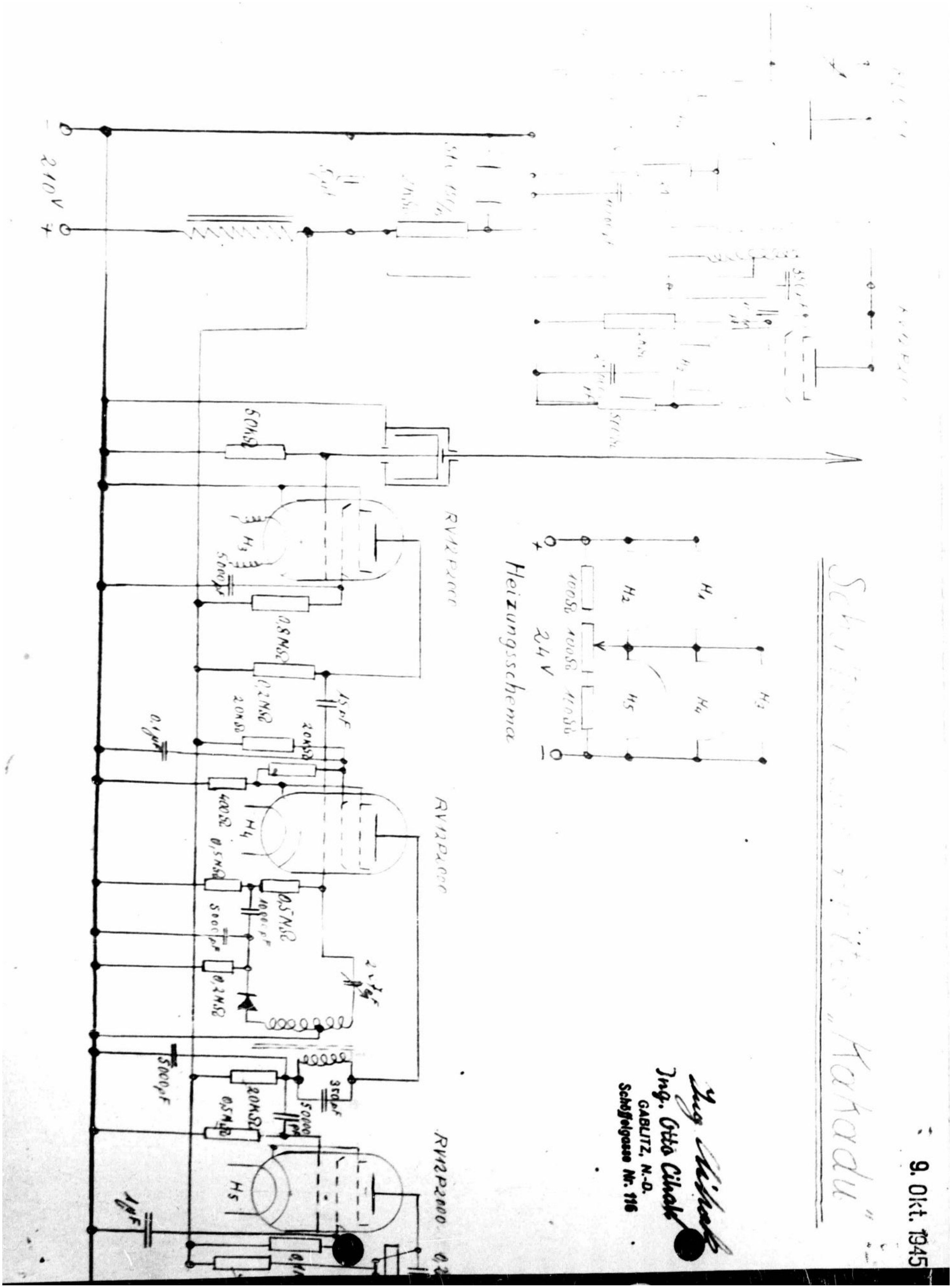

Kakadu
9. Okt. 1945
Heizungsschema
24V
RV12P2000
RV12P2000
RV12P2000
Ing. Otto Cihak
GABLITZ, N.-D.
Schöffelgasse Nr. 116

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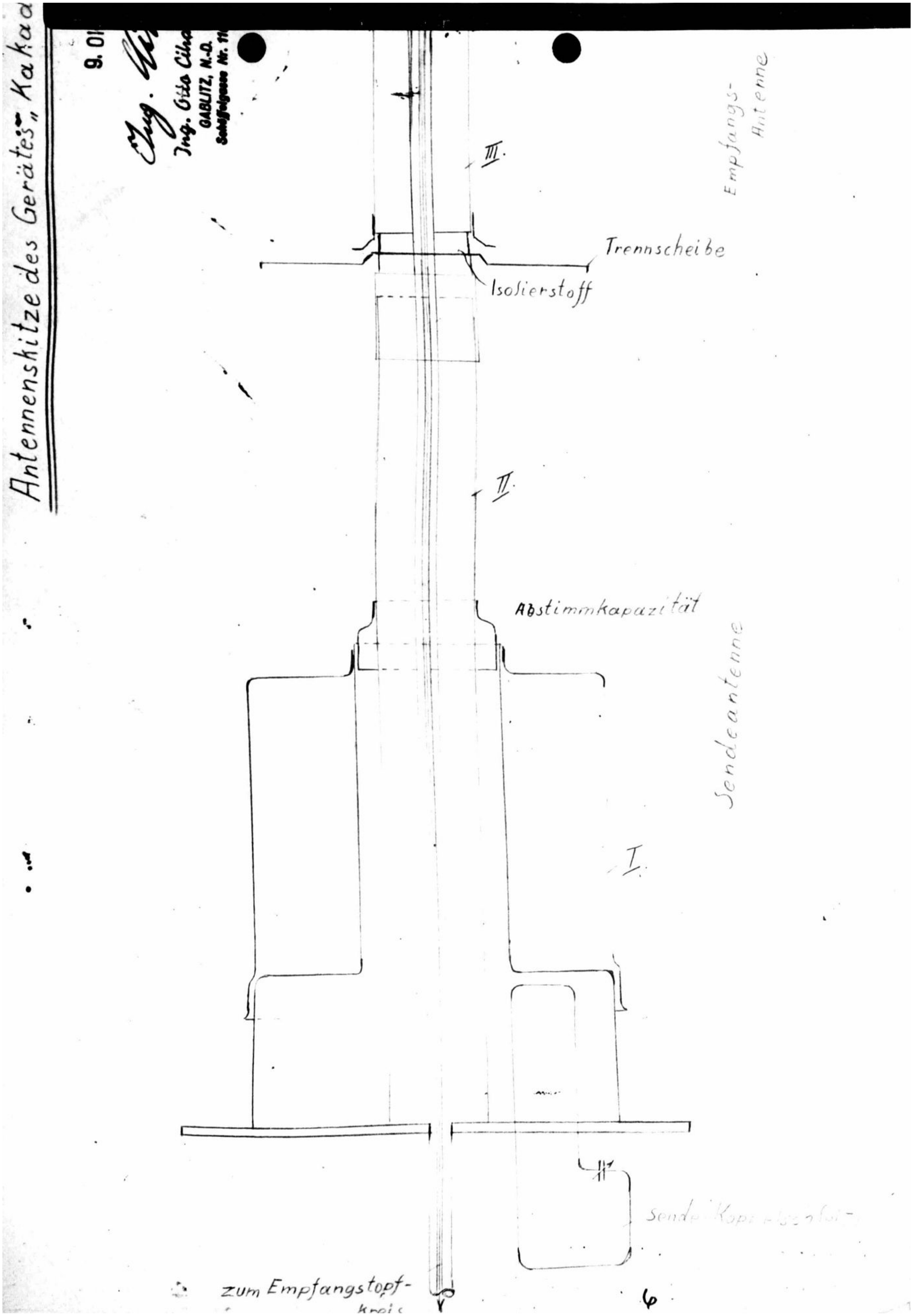
Antennenskitze des Gerätes „Kakad
Ing. Otto Ciha
GABLITZ, N.-D.
Empfangs-Antenne
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Trennscheibe
Isolierstoff
II.
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29 N 45 53180368 EF30/F41 Qc/EF 1 N 45 Routing Sp D Arm R & E E & D R CGD-11	Nav Tech Mis Eu Translation Serial No. 1665 9 Oc 45 4 p 2 il Translated from: Beschreibung des Gerätes "Kakadu", Ing. O. Cihak, Danubia A.G., Vienna	DESCRIPTION OF THE "KAKADU" PROXIMITY FUSE (GERMAN) Otto Cihak Three types of automatic fuses were used in the German Army. These were optical, acoustic, and radio frequency types. For the Henschel missile, the 298 Rocket it was intended to use primarily the "Kakadu" radio frequency fuse developed by the Donag, (Danubia A.G.). "Marabu" operated on the principle of radar. "Kugelblitz" fuse operated on the same principle as that developed by Donag. Both of these devices are substantially simpler than Kakadu with respect to number of tubes required, the complexity of construction, and especially with regard to tuning. However they did no meet the severe specifications imposed and were not equal to Kakadu in tests. The rocket had the form of an airplane and was driven with a rocket motor. At the nose of the fuselage the antenna for the fuse Kakadu was mounted under a wind scree The equipment had a cylindrical form about 30 cm. long and 15 cm. diameter. Antennas were made of aluminum tubes or strips. Chassis elements and containers for components were made of galvanized iron.

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